

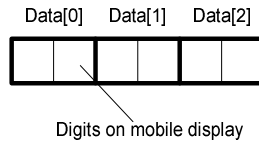
Encoding/Decoding data for CCM

MP – Version 2.00

MP

If the user requests the CCM, the shown data are collected from several places inside the mobile software. After collecting the data, the data are encoded and shown at the display. The program, running on WINDOWS® PCs, decodes the data and shows the information in a readable manner.

The following description uses the „C“ syntax for bit shift etc. Real code will need also some masks, to delete some bits after shifting. The description assumes that the shown values are stored into three 8 bit values (UINT8). *Data[0]* is the first value (first two digits), *Data[1]* the second and *Data[2]* the third (last two digits).



The first digits are used for automatically detection of the CCM version at the mobile:

CCM for MP or CP; // (1) 0 – MP | 1 – CP

CCM version; // (4) 32 different versions: 0000 -> 0 -> 2.00, 0001 -> 1 -> 2.02

General: (18 bit used)

Data:

Version; // (5) see description above

Accessory; // (4) 0000 – No accessory |
 0001 – Data Cable |
 0010 – Clip on Flash |
 0011 – Charger |
 0100 – Headset |
 0101 – Carkit |
 0110 – Bike-o-Meter |
 0111 – Unknown *1
 1000 – Unsupported *2
 1001 – Reserved | *3
 1010 – Reserved |
 1011 – Reserved |
 1100 – Reserved |
 1101 – Reserved |
 1110 – Reserved |
 1111 – Reserved

Type of SIM card; // (2) 00 – No card |
 01 – 3V |
 10 – 1.8V |
 11 – Reserved

MMC/RMMC card; // (3) 000 – No card available
 001 – 32MB |
 010 – 64MB |
 011 – 128MB |

04	SIM-Card, AMR, MNC & MCC	18.08.04	He	DATUM 21.06.04	Systemtest ST2 KLF 1	BNR
03	EMO & BlackBerry & State changed	28.06.04	He	NAME R.Heulmanns		
02	BlackBerry	25.06.04	He	I&T Kamp-Lintfort		Xnnnn
01	First issue	21.06.04	He			
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100 – 256MB |
 101 – 512MB |
 110 – Reserved |
 111 – Reserved
 RACH; // (1) 0 – not okay, 1 – okay
 Camera okay; // (1) 0 – not okay, 1 – okay *4
 EMO-Device; // (1) 0 – not available (not detected) | 1 – available *1 *5
 EMO-Application; // (1) 0 – Java assistance not activated | 1 – Java assistance activated *1 *6

- *1 – accessory detected, but unknown (no Siemens accessory)
- *2 – unsupported accessory, for example a clip on camera plug into a mobile with integrated camera
- *3 – reserved for accessory coming in future
- *4 – check, if communication between camera module and mobile is okay (self diagnosis of camera?)
- *5 – using an EMO is independent of using another accessory
- *6 – a kind of setup but used only in combination with the EMO-device

Encoding:

General [0] + General [1] + General [2]-> UINT24

General = MP_CP_ID << 23;
 General |= CCM_Version << 19;
 General |= Accessory << 15;
 General |= SimCardType << 13;
 General |= MMC << 10;
 General |= RACH << 9;
 General |= Camera << 8;
 General |= EMO-Device << 7;
 General |= EMO-Application << 6;

The RACH information is read from the GSM history block in EEFUL (block 5016 in L55, R65). This block contains a lot of counters (see documentation about the developer menu – section GSM history). The RACH counter is a special counter. If an error occurs, this counter is incremented by 5. Each successful operation decreases the counter by 1 (until 0). So normally this counter is near zero. If a product has a real problem, the counter value will be grown. If the counter value is higher than a threshold (now 20), the RACH indicator is set.

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						VON 8

Setup: (22 bit)

Data:

Version;	// (5)	see description above
Irda;	// (1)	0 – Off 1 – On *1
PowerSave;	// (1)	0 – Off 1 – On
Ringtones;	// (1)	0 – Off 1 – On
Light;	// (4)	0000 – Off 0001 – 10% 0010 – 20% 0011 – 30% 0100 – 40% 0101 – 50% 0110 – 60% 0111 – 70% 1000 – 80% 1001 – 90% 1010 – 100% 1011 – Reserved 1100 – Reserved 1101 – Reserved 1110 – Reserved 1111 – Reserved
Vibra;	// (1)	0 – Off 1 – On
AutoOff;	// (1)	0 – Off 1 – On
Filter;	// (1)	0 – Off 1 – On
Gprs;	// (1)	0 – Off 1 – On *1
Bluetooth;	// (1)	0 – Off 1 – On *1
Auto network;	// (1)	0 – Off 1 – On
Dynamic light;	// (1)	0 – Off 1 – On *1
Animations;	// (1)	0 – Off 1 – On *2
BlackBerry;	// (2)	00 – no BlackBerry 01 – BlackBerry - prosumer 10 – BlackBerry - enterprise 11 – Reserved

*1 – shown for all products. If the product doesn't have the feature, the setting is Off/not available

*2 – screensaver animation activated (switch on/off animation has no influence on the standby time)

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						VON 8

Encoding:

Setup [0] + Setup [1] + Setup [2]-> UINT24

Setup = MP_CP_ID << 23;

Setup |= CCM_Version << 19;

Setup |= Irda << 18;

Setup |= PowerSave << 17;

Setup |= Ringtones << 16;

Setup |= Light << 12;

Setup |= Vibra << 11;

Setup |= AutoOff << 10;

Setup |= Filter << 9;

Setup |= Gprs << 8;

Setup |= Bluetooth << 7;

Setup |= Auto network << 6;

Setup |= Dynamic light << 5;

Setup |= Animations << 4;

Setup |= Blackberry << 2;

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						VON 8

Network: (18 bit)

Data:

Version; // (5) see description above
 MobileState; // (3) 000 – Idle (full service) |
 001 – Idle (limited service) |
 010 – Idle (only SOS) |
 011 – Call |
 100 – Scan |
 101 – Reserved
 110 – Reserved |
 111 – Reserved
 PerLocUpdate; // (1) 0 – Off | 1 - On
 Neighbours; // (4) value 0-15
 RxLevel; // (1) 0 - > -95 dBm | 1 - <= -95 dBm
 Multiframe; // (3) 000 – 2 |
 001 – 3 |
 010 – 4 |
 011 – 5 |
 100 – 6 |
 101 – 7 |
 110 – 8 |
 111 – 9
 PBCCH; // (1) 0 – Off | 1 – On

Encoding:

Network [0] + Network [1] + Network [2]-> UINT24
 Network = MP_CP_ID << 23;
 Network |= CCM_Version << 19;
 Network |= MobileState << 16;
 Network |= PerLocUpdate << 15;
 Network |= Neighbours << 11;
 Network |= RxLevel << 10;
 Network |= Multiframe << 7;
 Network |= PBCCH << 6;

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Battery: (24 bit)

Data:

Version;	// (5)	see description above
Battery;	// (3)	000 – 0 % (empty) 001 – 15% 010 – 30% 011 – 45% 100 – 60% 101 – 80% 110 – 100% 111 – charger connected
ChargeCount;	// (4)	-> after special quantisation coding of 16 bit value *1
ChargeBroken;	// (3)	-> after special quantisation coding of 16 bit value *2
ChargeUsb;	// (3)	-> after special quantisation coding of 16 bit value *2
TimeSinceLastCharge;	// (3)	000 – < 300 minutes = 5 hours 001 – 301 ... 1440 minutes = 24 hours = 1 day 010 – 1441 ... 2880 minutes = 48 hours = 2 days 011 – 2801 ... 5760 minutes = 96 hours = 4 days 100 – 5761 ... 9000 minutes = 150 hours ~ 6 days 101 – 9001 ... 12000 minutes = 200 hours ~ 8 days 110 – 12001 ... 18000 minutes = 300 hours = 12 ½ days 111 – > 18000 minutes
LengthOfCharge;	// (3)	000 – < 5 minutes 001 – 6 ... 15 minutes 010 – 16 ... 30 minutes 011 – 31 ... 60 minutes 100 – 61 ... 90 minutes 101 – 91 ... 120 minutes 110 – 121 ... 180 minutes 111 – > 180 minutes

Encoding:

Battery [0] + Battery [1] + Battery [2] -> UINT24

Battery = MP_CP_ID << 23;

Battery |= CCM_Version << 19;

Battery |= Battery << 16;

Battery |= ChargeCount << 12;

Battery |= ChargeBroken << 9;

Battery |= ChargeUsb << 6;

Battery |= TimeSinceLastCharge << 3;

Battery |= LengthOfCharge;

*1 – The charge count is quantized to the serie 2^n (1, 2, 4, 8, 16, 32, 32768).

The range of n : $0 < n < 15$ (corresponds to $0x0 < n < 0xF$) and is displayed

*2 – The ratio are calculated by the following instructions:

ChargeBrokenRatio = (UINT8)((7*ChargeBroken) / ChargeCount);

ChargeUsbRatio = (UINT8)((7*ChargeUsb) / ChargeCount);

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Diagnosis: (20 bit)

Data:

Version;	// (5)	see description above
Turnoff;	// (3)	000 – 0 001 – 1...2 010 – 3...5 011 – 6...9 100 – 10...14 101 – 15...21 110 – 22...29 111 – 30 and higher
Exit;	// (3)	000 – 0 001 – 1...2 010 – 3...5 011 – 6...9 100 – 10...14 101 – 15...21 110 – 22...29 111 – 30 and higher
Refresh;	// (3)	000 – 0 001 – 1...2 010 – 3...5 011 – 6...9 100 – 10...14 101 – 15...21 110 – 22...29 111 – 30 and higher
Operating time;	// (3)	000 – 0 001 – 1...2 010 – 3...6 011 – 7...12 100 – 13...20 101 – 21...30 110 – 31...42 111 – 43 and higher
Talk time;	// (3)	000 – 0 001 – 1...3 010 – 4...7 011 – 8...12 100 – 13...18 101 – 19...25 110 – 26...33 111 – 34 and higher

Encoding :

Diagnosis [0] + Diagnosis [1] + Diagnosis [2]-> UINT24
 Diagnosis = MP_CP_ID << 23;
 Diagnosis |= CCM_Version << 19;
 Diagnosis = Turnoffs << 16;
 Diagnosis |= Exits << 13;
 Diagnosis |= Refresh << 10;
 Diagnosis |= Operating time << 7;
 Diagnosis |= talk time << 4;

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						VON 8

Provider: (24 bit)

Data:

Version; // (5) see description above
 MCC; // (10) mobile country code – $2^{10} = 1024$ codes, use the original codes, e.g. 262 for Germany
 MNC; // (9) mobile national code – $2^9 = 512$ codes, use the original codes, e.g. 01 for T-Mobile

For the provider, the original GSM codes are used to avoid additional conversion tables to code/encode providers in the mobile. The windows program will translate known codes to show the real provider name.
 The high number of bits is used, because MCC number higher than 512 are used, e.g. New-Zeeland (530), Thailand (520).
 For MNC, there are codes higher than 256, e.g. USA Powertel (270), USA.

```

Provider[0] + Provider [1] + Provider [2]-> UINT24
Provider = MP_CP_ID << 23;
Provider |= CCM_Version << 19;
Provider |= MCC << 9;
Provider |= MNC;
    
```

Remark:

The GSM specification describes the MCC and MNC as BCD coded figures. Because of the limited space for the CCM, the BCD figures are transferred to the binary format. The GSM specification allows invalid BCD figures (> 9). If the mobile detects such invalid figures, all bits of the corresponding code are set to 1.

Example:

CCM-Version: MP – Version 2.00

MCC: 2A2 (invalid, because A is not allowed) -> CCM-MCC: $111111111_{bin} = 1023_{dec}$

MNC: 2

Corresponding bit field:

Version	MCC	MNC
0 000 0	111 1111 111	0 0000 0010
0	7	F E 0 2

By CCM displayed data:

07FE02

Decoded by Windows program:

MCC: invalid
 MNC: 2

After updating the mobile SW, the above described counters (battery & diagnosis) should be reset by the mobile SW.

Attention:

Inside some mobile SW, there are total counters for the total lifetime of the mobile and there are SW dependent counters. The SW dependent counters are shown by CCM, the other counters are readable by the service department via the serial port.

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